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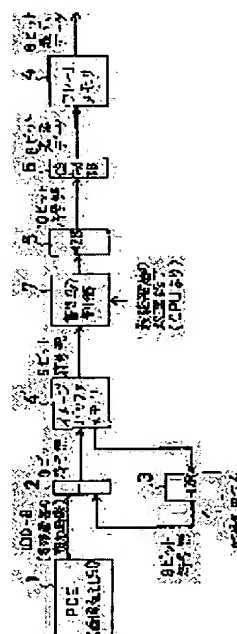
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(54) METHOD AND DEVICE FOR DECODING AND DISPLAYING PICTURE DATA

(57)Abstract:

PURPOSE: To secure a display time of a high quality picture and to suppress flickering of a picture when picture data coded hierarchically are decoded and displayed in a short time by reducing number of times of display of a progressive decoding picture.

CONSTITUTION: An image buffer memory 4' stores a progressive decoding picture based on a decoded picture outputted from a picture decoding integrated circuit 1. A write control means 7 transfers a decoded picture of the memory 4' to a frame memory 4 upon the notice of a processing end of a final layer and rewrites the content of the memory 4. The memory 4 stores display data and the content of the memory 4 is displayed on a display screen. When coded data in four layers are decoded at a speed of 5 sheets/sec, all of the display time of 1/5sec are used for displaying the decoded picture and the picture of high quality is always obtained.



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CLAIMS

[Claim(s)]

[Claim 1] The restoration image which decrypts according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n -th hierarchy's code data is sent, decrypts the code data of the i -th hierarchy (i is 1, 2, —, n) of an image, and is obtained, The i -th progressive restoration image is generated based on the progressive restoration image of eye ** ($i-1$) watch which the code data of the 1st hierarchy thru/or a ** ($i-1$) hierarchy was decrypted, and was obtained. The image reconstitution-of-data method of presentation which is the image reconstitution-of-data method of presentation which displays a progressive restoration image, and is characterized by displaying progressive restoration m of n progressive restoration images (m being smallness from n) on a display.

[Claim 2] The image reconstitution-of-data method of presentation of claim 1 characterized by the progressive restoration image displayed on a display being the n -th progressive restoration image.

[Claim 3] The restoration image which decrypts according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n -th hierarchy's code data is sent, decrypts the code data of the i -th hierarchy (i is 1, 2, —, n) of an image, and is obtained, The i -th progressive restoration image is generated based on the progressive restoration image of eye ** ($i-1$) watch which the code data of the 1st hierarchy thru/or a ** ($i-1$) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. While displaying on a display the progressive restoration image currently generated at the time whenever it initializes a timer at the time of reception initiation of the code data of the 1st hierarchy of an image and a timer clocks fixed time amount The image reconstitution-of-data method of presentation characterized by displaying the last progressive restoration image.

[Claim 4] The restoration image which decrypts according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n -th hierarchy's code data is sent, decrypts the code data of the i -th hierarchy (i is 1, 2, —, n) of an image, and is obtained, The i -th progressive restoration image is generated based on the progressive restoration image of eye ** ($i-1$) watch which the code data of the 1st hierarchy thru/or a ** ($i-1$) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. The image reconstitution-of-data method of presentation characterized by displaying many progressive restoration images on a display when the transmission duration of an image is long, and displaying a small number of progressive restoration image on a display when the transmission duration of an image is short.

[Claim 5] The restoration image which decrypts according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n -th hierarchy's code data is sent, decrypts the code data of the i -th hierarchy (i is 1, 2, —, n) of an image, and is obtained, The i -th progressive restoration image is generated based on the progressive restoration image of eye ** ($i-1$) watch which the code data of the 1st hierarchy thru/or a ** ($i-1$) hierarchy was decrypted, and was obtained. The image reconstitution-of-data method of presentation characterized by determining the progressive restoration image which is the image reconstitution-of-data method of presentation which displays a progressive restoration image, evaluates the display duration of an image, and is displayed on a display based on an evaluation result.

[Claim 6] The restoration image which decrypts according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n -th hierarchy's code data is sent, decrypts the code data of the i -th hierarchy (i is 1, 2, —, n) of an image, and is obtained, The i -th progressive restoration image is generated based on the progressive restoration image of eye ** ($i-1$) watch which the code data of the 1st hierarchy thru/or a ** ($i-1$) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. The image reconstitution-of-data method of presentation characterized by judging whether all progressive restoration images are displayed or a limited number of progressive restoration images are displayed based on the display duration of an image, and displaying a progressive restoration image on a display based on a decision result.

[Claim 7] The restoration image which decrypts according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n -th hierarchy's code data is sent, decrypts the code data of the i -th hierarchy (i is 1, 2, —, n) of an image, and is obtained, The i -th progressive restoration image is generated based on the progressive restoration image of eye ** ($i-1$) watch which the code data of the 1st hierarchy thru/or a ** ($i-1$) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. The image reconstitution-of-data method of presentation characterized by displaying many progressive restoration images on a display when image size is large, and displaying a small number of progressive restoration image on a display when image size is small.

[Claim 8] The restoration image which decrypts according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n -th hierarchy's code data is sent, decrypts the code data of the i -th hierarchy (i is 1, 2, —, n) of an image, and is obtained, The i -th progressive restoration image is generated based on the progressive restoration image of eye ** ($i-1$) watch which the code data of the 1st hierarchy thru/or a ** ($i-1$) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. The image reconstitution-of-data method of presentation characterized by displaying many progressive restoration images on a display when the amount of data of an image is large, and displaying a small number of progressive restoration image on a display when the amount of data of an image is small.

[Claim 9] The restoration image which decrypts according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n -th hierarchy's code data is sent, decrypts the code data of the i -th hierarchy (i is 1, 2, —, n) of an image, and is obtained, The i -th progressive restoration image is generated based on the progressive restoration image of eye ** ($i-1$) watch which the code data of the 1st hierarchy thru/or a ** ($i-1$) hierarchy was decrypted, and was obtained. The image reconstitution-of-data method of presentation characterized by determining the progressive restoration image which is the image reconstitution-of-data method of presentation which displays a progressive restoration image, and should be displayed on a display based on the coding conditions of an image.

[Claim 10] image restoration circuit (1) which generates a restoration image based on the i -th hierarchy's ($i=1, 2, \dots, n$) inputted code data Image buffer memory (4'), image restoration circuit (1) The i -th progressive restoration image is generated based on

the restoration image by the code data of the i -th hierarchy ($i = 1, 2, \dots, n$) outputted, and the progressive restoration image of eye $** (i-1)$ watch are stored in image buffer memory (4'). from — a storing means (2 3) to store the i -th progressive restoration image in image buffer memory (4') Frame memory which stores an indicative data (4) Image buffer memory (4') and frame memory (4) Renewal means of a frame memory installed in between (5, 6, 7) It provides. Renewal means of a frame memory (5, 6, 7) When processing of a hierarchy's code data defined beforehand is completed, the contents of image buffer memory (4') are followed, and it is a frame memory (4). Hierarchy code data restoration equipment characterized by updating the contents.

[Claim 11] image restoration circuit (1) which generates a restoration image based on the i -th hierarchy's ($i = 1, 2, \dots, n$) inputted code data Image buffer memory (4'), image restoration circuit (1) The i -th progressive restoration image is generated based on the restoration image by the code data of the i -th hierarchy ($i = 1, 2, \dots, n$) outputted, and the progressive restoration image of eye $** (i-1)$ watch are stored in image buffer memory (4'). from — a storing means (2 3) to store the i -th progressive restoration image in image buffer memory (4') frame memory (4) which stores an indicative data Image buffer memory (4') and frame memory (4) Renewal means of a frame memory (5, 6, 7) installed in between timer (8) providing — timer (8) whenever it is initialized at the time of reception of an image and clocks fixed time amount after it — a display command — generating — renewal means of a frame memory (5, 6, 7) When processing of the last hierarchy is completed, the contents of image buffer memory (4') are followed, and it is a frame memory (4). While updating the contents Timer (8) When a display command is generated, the contents of image buffer memory (4') are followed, and it is a frame memory (4). Hierarchy code data restoration equipment characterized by updating the contents.

[Claim 12] image restoration circuit (1) which generates a restoration image based on the i -th hierarchy's ($i = 1, 2, \dots, n$) inputted code data Image buffer memory (4'), image restoration circuit (1) The i -th progressive restoration image is generated based on the restoration image by the code data of the i -th hierarchy ($i = 1, 2, \dots, n$) outputted, and the progressive restoration image of eye $** (i-1)$ watch are stored in image buffer memory (4'). from — a storing means (2 3) to store the i -th progressive restoration image in image buffer memory (4') frame memory (4) which stores an indicative data Image buffer memory (4') and frame memory (4) Renewal means of a frame memory (5, 6, 7) installed in between display hierarchy decision means (9) providing — display hierarchy decision means (9) the progressive restoration image which should be displayed — determining — renewal means of a frame memory (5, 6, 7) Display hierarchy decision means (9) When the determined progressive restoration image is generated, the contents of image buffer memory (4') are followed, and it is a frame memory (4). Hierarchy code data restoration equipment characterized by updating the contents.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the image reconstitution-of-data method of presentation and equipment which were encoded hierarchical. Since it is very large compared with a document etc., when it stores or the amount of data of image data is transmitted, the coding technique which compresses the amount of data began to be used widely. The coding approach hierarchical also in the various coding approaches attracts attention as an advantageous approach, when transmitting using the late transmission line.

[0002] The hierarchical coding approach is the approach of dividing an image into two or more hierarchies, and encoding. For example, if it is data encoded to five hierarchies, if the 1st hierarchy's data are restored, a coarse rough image can be obtained, and a clearer image can be restored, if the 1-2nd, the 1-3rd —, and the hierarchy that restores are increased so that it may be called the 1-5th. In the image reconstitution-of-data method of presentation and equipment which were encoded by the hierarchical coding approach, this invention prevents a flicker in the case of displaying many images for a short time, and raises the quality of a display image.

[0003]

[Description of the Prior Art] The equipment in connection with the image reconstitution of data and the display encoded hierarchical is reported to 20th page — page [25th] "the description of the color still picture coding LSI and application" of the magazine "electronic technical" June, 1991 issue. Hereafter, let this reference be reference 1. Drawing 8 is the same as drawing 10 of reference 1. In drawing 8, + circuit, three to 128 circuit, and 4 show a frame memory and five to 128 circuit, and, as for 1, 6 shows the value limiting circuit, as for an image restoration integrated circuit and 2.

[0004] The image restoration integrated circuit 1 restores the code data encoded by the ADCT (Adaptive Discrete Cosine Transform) method, and outputs the restoration image which added offset of +128. + A circuit 2 adds what subtracted 128 from the pixel value outputted from the image restoration integrated circuit 1, and the value of the same pixel stored in the frame memory 4. + The output of a circuit 2 is stored in a frame memory 4. A frame memory 4 stores a progressive restoration image with offset of 128. The data read from the frame memory 4 are outputted as a 8-bit indicative data via -128 circuit 5 and the value limiting circuit 6.

[0005] An image is divided into a 8x8-pixel block. The partial image of each block is expressed by the DCT multiplier of 64 pieces. The DCT multiplier of 64 pieces is divided into four groups. A transmitting side transmits the code data of the 1st hierarchy who expresses the list (the average value of the pixel value for every block is included) of the 1st group of each block to the beginning, transmits the code data of the 2nd hierarchy who expresses the list of the 2nd group of each block below, transmits the code data of the 3rd hierarchy who expresses the list of the 3rd group of each block below, and transmits the code data of the 4th hierarchy who expresses the list of the 4th group of each block to the last.

[0006] If the code data of the 1st hierarchy of an image is inputted, the image restoration integrated circuit 1 will output the restoration image which decrypts the 1st hierarchy's code data and is obtained. The restoration image based on the 1st hierarchy's code data is stored in a frame memory 4 as it is.

[0007] If the code data of the 2nd hierarchy of an image is inputted, the image restoration integrated circuit 1 will output the restoration image which decrypts the 2nd hierarchy's code data and is obtained. The restoration image based on the 2nd hierarchy's code data and the 1st progressive restoration image (what was made actual -128) stored in the frame memory 4 are added, the 2nd progressive restoration image is generated, and the 2nd progressive restoration image is stored in a frame memory 4.

[0008] If the code data of the 3rd hierarchy of an image is inputted, the image restoration integrated circuit 1 will output the restoration image which decrypts the 3rd hierarchy's code data and is obtained. The restoration image based on the 3rd hierarchy's code data and the 2nd progressive restoration image stored in the frame memory 4 are added, the 3rd progressive restoration image is generated, and the 3rd progressive restoration image is stored in a frame memory 4.

[0009] If the code data of the 4th hierarchy of an image is inputted, the image restoration integrated circuit 1 will output the restoration image which decrypts the 4th hierarchy's code data and is obtained. The restoration image based on the 4th hierarchy's code data and the 3rd progressive restoration image stored in the frame memory 4 are added, the 4th progressive restoration image is generated, and the 4th progressive restoration image is stored in a frame memory 4.

[0010] According to the hierarchy code data restoration equipment of drawing 8, an indicative data is changed whenever one hierarchy's data are restored. That is, if the code data encoded hierarchical is received and the case where it indicates by restoration is made into an example, one hierarchy's sign is received, and whenever the data is restored, a display image will change to a high-definition thing. Before transmission of one image is completed at a low speed by the transmission line, when taking long time amount, in a receiving side, reception initiation of transmission of all the data of one image being completed can be carried out without waiting, the whole picture of a rough image can be seen immediately, and a high-definition image can be seen gradually. According to this approach, for those who are looking at the receiving image, there is effectiveness, like a mental burden decreases and it can be said to be the effective method of presentation.

[0011] Drawing 9 is drawing showing the example of the structure of a system which used image restoration LSI. this drawing — setting — 1 — an image restoration integrated circuit and 4 — a frame memory and 10 — a central processing unit and 11 — in an image scanner and 14, table memory and 15 show a counter and, as for main memory and 12, 16 shows [a DMA controller and 13] the CRT controller, respectively. Drawing 9 is the same as drawing 6 of reference 1. The image restoration integrated circuit 1 also has the function which encodes image data by the ADCT method. Although not illustrated, the LAN processor which controls LAN is connected to the system bus.

[0012]

[Problem(s) to be Solved by the Invention] Thus, a Prior art is very effective when the transmission line is a low speed. However, it is not what assumed the case where many images were indicated by restoration for a short time, using the high-speed transmission lines, such as LAN. Therefore, if conventional equipment is used when indicating many images by restoration for a

short time using the high-speed transmission line, the following problems will arise.

[0013] Drawing 10 is a timing diagram which shows actuation of the conventional example shown in drawing 8. For example, the image data of a large number encoded to four hierarchies is transmitted in 5 images / second, and the case where this is similarly restored and displayed in 5 images / second is assumed. The vocabulary called "reception" shows the time of day which reception ended, and the vocabulary "restoration" shows the time of day which restoration ended. With conventional equipment, for 1 / 5 seconds will be displayed and each image will change from a rough image to a high-definition image gradually in this 1 / 5 seconds.

[0014] Now, an image changes every [1 /] 20 seconds, and it is clear that an image flickers and is hard to see. Moreover, among the display time for 1 / 5 seconds of each image, the display time of a high-definition image is for 1 / 20 seconds slightly, and the observation time amount of the image of low grace becomes a ***** for those who are looking at the image.

[0015] Although there is individual difference, if a display duration exceeds 1 / 2 seconds in retrieval, some "waiting" will be sensed and it will be thought that it becomes unpleasant. Therefore, if it says roughly, even if it will change the progressive display image for raising the grace of an image at spacing shorter than 1/2 second, there is no semantics which reduces "waiting" and an image only increases a flicker, and it is only hard to see. When indicating the image data encoded hierarchical for a short time by restoration, this invention secures the display time of a high-definition image, and aims at suppressing a flicker of an image.

[0016]

[Means for Solving the Problem] The image reconstitution-of-data method of presentation of claim 1 is decrypted according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n-th hierarchy's code data is sent. The restoration image which decrypts the code data of the i-th hierarchy (i is 1, 2, —, n) of an image, and is obtained. The i-th progressive restoration image is generated based on the progressive restoration image of eye ** (i-1) watch which the code data of the 1st hierarchy thru/or a ** (i-1) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image, and is characterized by displaying progressive restoration m of n progressive restoration images (m being smallness from n) on a display.

[0017] The image reconstitution-of-data method of presentation of claim 2 is characterized by the progressive restoration image displayed on a display being the n-th progressive restoration image in the image reconstitution-of-data method of presentation of claim 1.

[0018] The image reconstitution-of-data method of presentation of claim 3 is decrypted according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n-th hierarchy's code data is sent. The restoration image which decrypts the code data of the i-th hierarchy (i is 1, 2, —, n) of an image, and is obtained. The i-th progressive restoration image is generated based on the progressive restoration image of eye ** (i-1) watch which the code data of the 1st hierarchy thru/or a ** (i-1) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. While displaying on a display the progressive restoration image currently generated at the time whenever it initializes a timer at the time of reception initiation of the code data of the 1st hierarchy of an image and a timer clocks fixed time amount, it is characterized by displaying the last progressive restoration image.

[0019] The image reconstitution-of-data method of presentation of claim 4 is decrypted according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n-th hierarchy's code data is sent. The restoration image which decrypts the code data of the i-th hierarchy (i is 1, 2, —, n) of an image, and is obtained. The i-th progressive restoration image is generated based on the progressive restoration image of eye ** (i-1) watch which the code data of the 1st hierarchy thru/or a ** (i-1) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. It is characterized by displaying many progressive restoration images on a display, when the transmission duration of an image is long, and displaying a small number of progressive restoration image on a display, when the transmission duration of an image is short.

[0020] The image reconstitution-of-data method of presentation of claim 5 is decrypted according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n-th hierarchy's code data is sent. The restoration image which decrypts the code data of the i-th hierarchy (i is 1, 2, —, n) of an image, and is obtained. The i-th progressive restoration image is generated based on the progressive restoration image of eye ** (i-1) watch which the code data of the 1st hierarchy thru/or a ** (i-1) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image, and the display duration of an image is evaluated and it is characterized by determining the progressive restoration image displayed on a display based on an evaluation result.

[0021] The image reconstitution-of-data method of presentation of claim 6 is decrypted according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n-th hierarchy's code data is sent. The restoration image which decrypts the code data of the i-th hierarchy (i is 1, 2, —, n) of an image, and is obtained. The i-th progressive restoration image is generated based on the progressive restoration image of eye ** (i-1) watch which the code data of the 1st hierarchy thru/or a ** (i-1) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. Based on the display duration of an image, it judges whether all progressive restoration images are displayed or a limited number of progressive restoration images are displayed, and is characterized by displaying a progressive restoration image on a display based on a decision result.

[0022] The image reconstitution-of-data method of presentation of claim 7 is decrypted according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n-th hierarchy's code data is sent. The restoration image which decrypts the code data of the i-th hierarchy (i is 1, 2, —, n) of an image, and is obtained. The i-th progressive restoration image is generated based on the progressive restoration image of eye ** (i-1) watch which the code data of the 1st hierarchy thru/or a ** (i-1) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. It is characterized by displaying many progressive restoration images on a display, when image size is large, and displaying a small number of progressive restoration image on a display, when image size is small.

[0023] The image reconstitution-of-data method of presentation of claim 8 is decrypted according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n-th hierarchy's code data is sent. The restoration image which decrypts the code data of the i-th hierarchy (i is 1, 2, —, n) of an image, and is obtained. The i-th progressive restoration image is generated based on the progressive restoration image of eye ** (i-1) watch which the code data of the 1st hierarchy thru/or a ** (i-1) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image. It is characterized by displaying many progressive restoration images on a display, when the amount of data of an image is large, and displaying a small number of progressive restoration image on a display, when the amount of data of an image is small.

[0024] The image reconstitution-of-data method of presentation of claim 9 is decrypted according to the code data of the 1st hierarchy about an image, the 2nd hierarchy's code data, —, the sequence that the n-th hierarchy's code data is sent. The restoration image which decrypts the code data of the i-th hierarchy (i is 1, 2, —, n) of an image, and is obtained. The i-th

progressive restoration image is generated based on the progressive restoration image of eye ** (i-1) watch which the code data of the 1st hierarchy thru/or a ** (i-1) hierarchy was decrypted, and was obtained. It is the image reconstitution-of-data method of presentation which displays a progressive restoration image, and is characterized by determining the progressive restoration image which should be displayed on a display based on the coding conditions of an image.

[0025] image restoration circuit (1) which generates a restoration image based on the code data of the i-th hierarchy ($i = 1, 2, \dots, n$) by whom the hierarchy code data restoration equipment of claim 10 was inputted Image buffer memory (4'), image restoration circuit (1) The i-th progressive restoration image is generated based on the restoration image by the code data of the i-th hierarchy ($i = 1, 2, \dots, n$) outputted, and the progressive restoration image of eye ** (i-1) watch are stored in image buffer memory (4'). from — a storing means (2 3) to store the i-th progressive restoration image in image buffer memory (4') Frame memory which stores an indicative data Image buffer memory (4') and frame memory (4) Renewal means of a frame memory installed in between (5, 6, 7) It provides. Renewal means of a frame memory (5, 6, 7) When processing of a hierarchy's code data defined beforehand is completed, the contents of image buffer memory (4') are followed, and it is a frame memory (4). It is characterized by updating the contents.

[0026] image restoration circuit (1) which generates a restoration image based on the code data of the i-th hierarchy ($i = 1, 2, \dots, n$) by whom the hierarchy code data restoration equipment of claim 11 was inputted Image buffer memory (4'), image restoration circuit (1) The i-th progressive restoration image is generated based on the restoration image by the code data of the i-th hierarchy ($i = 1, 2, \dots, n$) outputted, and the progressive restoration image of eye ** (i-1) watch are stored in image buffer memory (4'). from — a storing means (2 3) to store the i-th progressive restoration image in image buffer memory (4') frame memory (4) which stores an indicative data Image buffer memory (4') and frame memory (4) Renewal means of a frame memory (5, 6, 7) installed in between timer (8) providing — timer (8) whenever it is initialized at the time of reception of an image and clocks fixed time amount after it — a display command — generating — renewal means of a frame memory (5, 6, 7). When processing of the last hierarchy is completed, the contents of image buffer memory (4') are followed, and it is a frame memory (4). While updating the contents Timer (8) When a display command is generated, the contents of image buffer memory (4') are followed, and it is a frame memory (4). It is characterized by updating the contents.

[0027] image restoration circuit (1) which generates a restoration image based on the code data of the i-th hierarchy ($i = 1, 2, \dots, n$) by whom the hierarchy code data restoration equipment of claim 12 was inputted Image buffer memory (4'), image restoration circuit (1) The i-th progressive restoration image is generated based on the restoration image by the code data of the i-th hierarchy ($i = 1, 2, \dots, n$) outputted, and the progressive restoration image of eye ** (i-1) watch are stored in image buffer memory (4'). from — a storing means (2 3) to store the i-th progressive restoration image in image buffer memory (4') frame memory (4) which stores an indicative data Image buffer memory (4') and frame memory (4) Renewal means of a frame memory (5, 6, 7) installed in between display hierarchy decision means (9) providing — display hierarchy decision means (9) the progressive restoration image which should be displayed — determining — renewal means of a frame memory (5, 6, 7) Display hierarchy decision means (9) When the determined progressive restoration image is generated, the contents of image buffer memory (4') are followed, and it is a frame memory (4). It is characterized by updating the contents.

[0028]

[Function] Drawing 1 (a) It is the principle explanatory view of invention of claim 1. As mentioned above, in the Prior art, the 1st progressive restoration image, the 2nd progressive restoration image, —, the n-th progressive restoration image were displayed [image data / (the image data encoded hierarchical is hereafter taken as a hierarchy sign) / which was encoded hierarchical to n ($n > 1$) hierarchy] in order about one image. On the other hand, it sets to invention of claim 1 and is drawing 1 (a). A time and a different progressive restoration image are displayed m times ($m < n$) about one image so that it may be shown. Thus, if the count of a display of a progressive restoration image is lessened, since the count from which a display image changes will become fewer, a flicker of the display screen decreases and it becomes possible to work image retrieval etc. very comfortably. Moreover, by stopping the display of the image of low quality, the count of a display of a restoration image becomes fewer, only the part is enabled to increase the display time of the image of high quality, and it becomes possible to work image retrieval etc. using the image of high image quality which employed the description of a high speed line efficiently.

[0029] An operation of the image reconstitution-of-data method of presentation of claim 2 is explained. Only the progressive restoration image of the last of an image is displayed in the image reconstitution-of-data method of presentation of claim 2.

[0030] An operation of the image reconstitution-of-data method of presentation of claim 3 is explained. For example, n is 4 and assumes that it is that in which a timer generates a display command every $[1/2]$ seconds. If a period until the last (the 4th) progressive restoration image is generated from image reception considers as $1/2$ seconds or less about an image 1, only the last progressive restoration image will be displayed about an image 1. Supposing a period until the last progressive restoration image is generated from image reception about an image 2 is size from $1/2$ seconds, about an image 2, an intermediate progressive restoration image and the last progressive restoration image will be displayed.

[0031] An operation of the image reconstitution-of-data method of presentation of claim 4 is explained. For example, when the transmission line which transmits image data is a low-speed thing, all the progressive restoration images about an image are displayed, and when the transmission line is a high-speed thing, only the last progressive restoration image is displayed.

[0032] An operation of the image reconstitution-of-data method of presentation of claim 5 is explained. About an image 1, it is assumed that the time amount (display duration) required by generation of the last progressive restoration image from image reception is short. In this case, only the progressive restoration image of the last attached image 1, for example is displayed. About an image 2, it is assumed that a display duration is long. In this case, the intermediate progressive restoration image about an image 2 and the last progressive restoration image are displayed.

[0033] An operation of the image reconstitution-of-data method of presentation of claim 6 is explained. About an image 1, it is assumed that the time amount (display duration) required by generation of the last progressive restoration image from image reception is short. In this case, only the progressive restoration image of the last about an image 1 is displayed, for example. About an image 2, it is assumed that a display duration is long. In this case, all progressive restoration images are displayed about an image 2.

[0034] An operation of the image reconstitution-of-data method of presentation of claim 7 is explained. It is assumed that the image size of an image 1 is small. In this case, only the progressive restoration image of the last about an image 1 is displayed, for example. It is assumed that the image size of an image 2 is large. In this case, the intermediate progressive restoration image about an image 2 and the last progressive restoration image are displayed.

[0035] An operation of claim 8 is explained. About an image 1, it is assumed that the image amount of data is small. In this case, only the progressive restoration image of the last about an image 1 is displayed, for example. About an image 2, it is assumed that the image amount of data is large. In this case, the intermediate progressive restoration image about an image 2 and the last progressive restoration image are displayed.

[0036] An operation of the image reconstitution-of-data method of presentation of claim 9 is explained. For example, in the ADCT method, DCT conversion is carried out, the DCT multiplier obtained as a result is quantized, and Huffman coding of the result of quantization is carried out. If a quantization threshold is small, the amount of data of an image will increase, and if a quantization threshold is large, the amount of data of an image will decrease. About an image with a large quantization threshold,

only the last progressive restoration image is displayed, for example, and an intermediate progressive restoration image and the last progressive restoration image are displayed about an image with a small quantization threshold.

[0037] An operation of the hierarchy code data restoration equipment of claim 10 is explained. Drawing 1 (b) It is the principle explanatory view of the hierarchy code data restoration equipment of claim 10. It is assumed that it is $n=4$. Renewal means of a frame memory (5, 6, 7) When the 4th progressive restoration image (the last) is generated, the contents of image buffer memory (4') are followed, and it is a frame memory (4). The contents are updated. When the 2nd progressive restoration image is generated, the contents of the frame memory (4) are updated according to the contents of image buffer memory (4'), the last progressive restoration image is generated, and it sometimes follows at the contents of image buffer memory (4'), and is a frame memory (4). You may make it update the contents.

[0038] An operation of the hierarchy code data restoration equipment of claim 11 is explained. Drawing 1 (c) It is the principle explanatory view of the hierarchy code data restoration equipment of claim 11. Timer (8) It will be initialized if reception of an image is started, and a display command is emitted for every fixed time amount after it. Renewal means of a frame memory (5, 6, 7) It operates, when a display command is published, or when the last progressive restoration image is generated, and the contents of image buffer memory (4') are followed, and it is a frame memory (4). The contents are updated.

[0039] An operation of the hierarchy code data restoration equipment of claim 12 is explained. Drawing 1 (d) It is the principle explanatory view of the hierarchy code data restoration equipment of claim 12. A display hierarchy decision means (9) incorporates for example, image size, and determines the progressive restoration image which should be displayed by this. If $n=4$, when image size is large, it is a renewal means of a frame memory (5, 6, 7) about the display of the 1st progressive restoration image, the 2nd progressive restoration image, the 3rd progressive restoration image, and the 4th progressive restoration image. It orders. renewal means of a frame memory (5, 6, 7) When the 1st progressive restoration image is generated according to this command, When the 2nd progressive restoration image is generated, the 3rd progressive restoration image is generated and the 4th progressive restoration image is generated, the contents of image buffer memory (4') are followed, and it is a frame memory (4). The contents are updated. When image size is small, it is a renewal means of a frame memory (5, 6, 7) about the display of the 4th progressive restoration image (the last). It orders. Renewal means of a frame memory (5, 6, 7) When the 4th progressive restoration image is generated according to this command, the contents of image buffer memory (4') are followed, and it is a frame memory (4). The contents are updated.

[0040]

[Example] In explanation of the following examples, in order to explain as contrasted with the conventional example (thing of bibliography 1), the same notation is taken. Moreover, the target code data shall follow the JPEG method with which (the image data encoded hierarchical) is widely known as an international-standards method. However, this invention is applicable also to the hierarchy sign by other hierarchical coding approaches.

[0041] Drawing 2 is drawing showing the configuration of the 1st example of the hierarchy code data restoration equipment of this invention. this drawing — setting — 1 — in a frame memory and 4', image buffer memory, five to 128 circuit, and 6 show a value limiting circuit, and, as for an image restoration integrated circuit and 2, 7 shows [+ circuit, three to 128 circuit, and 4] the write-in control means, respectively.

[0042] The 1st example is equipment for indicating the image data encoded hierarchical for a short time by restoration, receives four hierarchies' hierarchy sign in a second in five sheets /, and explains it as what is restored. In the 1st example, the frame memory 4 of the conventional example is transposed to image buffer memory 4', and it has the write-in control means 7 and the composition that the frame memory 4 was added.

[0043] The central processing unit 10 contained in a system-wide configuration detects the last hierarchy's processing termination, and it is necessary to have the outputting function. This function manages a restoration processing story number of layers in a central processing unit 10, recognizes the last hierarchy, and if the restoration processing terminate signal from the image restoration integrated circuit 1 which performs restoration processing further is detected, it is realizable.

[0044] The function of each part of the 1st example is explained. Image buffer memory 4' is only what the frame memory 4 of the conventional example replaced, and has the same function. That is, the progressive restoration image based on the restoration image outputted from the image restoration integrated circuit 1 is stored. However, the contents of this image buffer memory 4' are not displayed as it is.

[0045] The write-in control means 7 is closed until the last hierarchy's processing termination is detected. If the last hierarchy's processing termination is notified, the restoration image (what was changed into 8 bits in fact) of image buffer memory 4' will be transmitted to a frame memory 4, and the contents of the frame memory 4 will be rewritten. The frame memory 4 stores the indicative data and the contents of the frame memory 4 are displayed on a display screen.

[0046] Drawing 3 is a timing diagram which shows actuation of the 1st example of this invention. Drawing 3 shows the case where the data encoded to four hierarchies are restored in a second in five sheets /. In the 1st example, since there is no rewriting of an unnecessary image, there is no flicker in each display image, and it becomes very vividly and legible. Moreover, all the display time (the example of illustration 1 / 5 seconds) assigned to each image is used for the display of the image (image restored using all the four hierarchies) of high quality, and it turns out that a display image is always quality.

[0047] In drawing 3, the direction of the image displayed in the 1st example is behind the conventional example in the display only for 3 / 20 seconds. However, since it is aimed at the case where an image changes for a short time one after another, in this invention, there is no effect of [on employment of this delay]. When changing an image one after another and performing image retrieval, speaking concretely, as for 3 / not influencing retrieval effectiveness, even if behind for 20 seconds, the display of an image can understand easily.

[0048] In the 1st example, in order to decrease a flicker of an image, it carried out to displaying only the last progressive restoration image. However, the progressive restoration image with which plurality differs may be displayed, such as also making the 2nd progressive restoration image into the object of a display, for example. In this case, since the count of a display will become fewer rather than it changes a display image, whenever a new progressive restoration image is generated if there are few counts of a display than the number of hierarchies (it sets in the 1st example and is 4), there is effectiveness of flicker prevention.

[0049] Drawing 4 is drawing showing the configuration of the 2nd example of the hierarchy code data restoration equipment of this invention. In this drawing, 8 shows a timer. In addition, the same sign as drawing 2 shows the same object. The 2nd example of this invention is explained. The 2nd example assumes that the case where the time amount taken to restore the image of one sheet can be managed in a short time, and long duration or the case where it cuts is intermingled to assuming the case where the 1st example restores many images for a short time. Thus, when restoring the hierarchy sign which received through the transmission line as an example in the case of being intermingled, a transmission line may be congested and a transmission duration may change according to condition. Moreover, the image (the amount of data is also various) of various magnitude may be received through the transmission line, and this may be restored.

[0050] Thus, about the long image of a transmission duration, when transmission durations differ, since the direction which also displayed the intermediate progressive restoration image does not make those who are looking at the image sense waiting, it can apply comfortably. In the 2nd example, it considered as the configuration which determines the count of a display automatically

according to a transmission duration. Moreover, although these criteria determined automatically could consider various approaches, they evaluate the time amount (display duration) which reception and restoration of data take by the 2nd example, and decided on it based on it in it.

[0051] With the configuration of the 2nd example, the conventional frame memory 4 is transposed to image buffer memory 4', and the frame memory 4, the write-in control means 7, and the timer 8 are newly added. Moreover, the last hierarchy's processing termination is detected to the central processing unit 10 contained in a system-wide configuration, and the outputting function is needed for it. Furthermore, the function which outputs reception initiation of each image is also required for a central processing unit 10.

[0052] The function of each part of the 2nd example is explained. The function of image buffer memory 4' and a frame memory 4 is the same as that of the 1st example. A timer 8 is initialized by the receiving start signal of each image, and generates a display command for every fixed time amount after it. What is necessary is just to set this signal generation spacing as $1 / \text{about } 2$ seconds that what is necessary is just the time amount of extent in which waiting of image display is not impressed to those who are looking at the image. Hereafter, the case where it sets up with $1 / 2$ seconds is explained.

[0053] The write-in control means 7 is closed until the last hierarchy's processing termination is detected or a display command is generated from a timer 8. If the last hierarchy's processing termination is detected or a display command is generated from a timer 8, the contents (what was changed into 8 bits in fact) of image buffer memory 4' will be transmitted to a frame memory 4, and the contents of the frame memory 4 will be rewritten.

[0054] Drawing 5 is a timing diagram which shows actuation of the 2nd example. Drawing 5 shows the case where the data encoded to four hierarchies are restored. Since reception of an image 2 starts and a timer 8 is reset from reception initiation of an image 1 $1 / \text{before } 2$ seconds pass, only the last progressive restoration image is displayed about an image 1. Except the last progressive restoration image, a flicker does not have the direction which is not displayed and an image 1 becomes very vividly and legible because it can be displayed in a short time.

[0055] Even if $1 / 2$ seconds pass since reception initiation of an image 2, since reception of an image 3 does not start, about an image 2, an intermediate progressive restoration image is also still displayed according to the display command (every $1 / 2$ seconds) outputted from a timer 8. Since an image is sharply displayed early rather than it finishes receiving all hierarchies, waiting is not impressed to those who are looking at the image. An image 3 is not displayed like an image 1 other than the last progressive restoration image.

[0056] Thus, in the 2nd example of this invention, since there is no rewriting of an unnecessary image like the 1st example when the duration to the progressive restoration image display of the last about one image is short, there is no flicker in each display image, and it becomes very legible. Moreover, when the duration to 1 image display is short, all the display time assigned to each image like the 1st example is used for the display of the image (the last progressive restoration image) of high quality, and it turns out that a display image is always high definition. Furthermore, in the 2nd example, when the duration to the display of the progressive restoration image of the last of one image is long, it is displayed that image quality improves gradually and waiting is not impressed to those who are looking at the image.

[0057] Drawing 6 is drawing showing the configuration of the 3rd example of the hierarchy code data restoration equipment of this invention. In this drawing, 9 shows a display hierarchy decision means. In addition, the same sign as drawing 2 shows the same object. The 3rd example assumes that the case where the time amount taken to restore the image of one sheet can be managed in a short time, and long duration or the case where it cuts is intermingled like the 2nd example. The time amount which transmits a hierarchy sign depending on the magnitude of an image shall be decided by the 3rd example, and this transmission time shall influence the time amount to restoration of an image in it.

[0058] The frame memory 4 of the conventional example is transposed to image buffer memory 4', and the configuration of the 3rd example has the composition that the frame memory 4, the write-in control means 7, and the display hierarchy decision means 9 were newly added. Moreover, while having the function for the central processing unit 10 in the configuration of the whole system to analyze the header of a JPEG method, and to judge the magnitude of an image, it is necessary to have the function which detects and outputs processing termination of each hierarchy and the last hierarchy.

[0059] The configuration of the header of a JPEG method is explained in detail in the special feature article "an understanding of image data compression and application (160 pages - 203 pages)" (following, bibliography 2) of the magazine interface December, 91 issue. If the configuration of the marker segment indicated by 175-page drawing 25 of this bibliography 2 is analyzed and it asks for the product of Y and X of this frame header, several pixel ball image size can be obtained.

[0060] The function of each part of the 3rd example is explained. The function of image buffer memory 4' and a frame memory 4 is the same as that of the 1st example. With [image size] a threshold [beyond], the display hierarchy decision means 9 displays all progressive restoration images, and if it is the following, it will display only the last progressive restoration image. That is, it carried out whether all progressive restoration images are displayed or only the last progressive restoration image would be displayed to the configuration to choose. Thus, compared with the 2nd example, the effectiveness of flicker prevention is fully acquired only also as a configuration which makes simple selection. Two or more thresholds are established and you may make it change the number of the progressive restoration images made into the object of a display according to image size.

[0061] Although based on such image size in the 3rd example, it is because this is aimed at the case where a display duration is dependent on image size as stated previously. This corresponds to claim 6.

[0062] When displaying all progressive restoration images, the write-in control means 7 transmits the contents (what was changed into 8 bits in fact) of image buffer memory 4' to a frame memory 4, whenever each hierarchy's processing termination is detected, and rewrites the contents of the frame memory 4. the case of a display of only the last progressive restoration image — final-treatment termination — detection — the contents (what was changed into 8 bits in fact) of shelf ** image buffer memory 4' are transmitted to a frame memory 4, and the contents of the frame memory 4 are rewritten.

[0063] Drawing 7 is a timing diagram which shows actuation of the 3rd example. Drawing 7 shows the case where the hierarchy sign encoded to four hierarchies is restored. By this timing diagram, since image size is small, an image 1 and an image 3 are considered as the display of only the last progressive restoration image, and since image size is large, the image 2 shows the case where it considers as the display of all progressive restoration images. When it can display in a short time so that clearly from drawing 7, only the last progressive restoration image is displayed, and when a display takes long time amount, it is displayed that image quality improves gradually. Therefore, display time is long and making those who are looking at the image sense the displeasure by flicker does not give irritation by this thing, either.

[0064] Although the progressive restoration image displayed on the basis of image size is determined in the 3rd example, the approach of the decision of the progressive restoration image which should be displayed is not restricted to this. For example, the amount of data of a hierarchy sign is greatly influenced by coding conditions. There is little amount of data of the hierarchy sign encoded on the coding conditions which become high compression, and there is much amount of data of the hierarchy sign encoded on the coding conditions which become low compression. Therefore, the method of determining the progressive restoration image which should be displayed on the basis of coding conditions is also effective.

[0065] Speaking concretely, by the JPEG method, controlling coding conditions by the quantization threshold as indicated by 165th page - the 167th page of bibliography 2. As it is in the configuration of the marker segment indicated by 178-page drawing

25 of bibliography 2, the value of this quantization threshold is easily acquired by analyzing a marker segment. Therefore, what is necessary is to notify this quantization threshold to the display hierarchy decision means 9 from a central processing unit 10, and just to determine it based on this amount.

[0066] Moreover, as long as the amount of data of the hierarchy sign of one image is known at the time of sign reception initiation, based on this amount of data, when there is much amount of data, many progressive restoration images are displayed, and when there is little amount of data, you may determine to display a small number of progressive restoration image. For example, if the amount of data is notified to a receiving side (restoration equipment) by the side which transmits a hierarchy sign before transmitting a hierarchy sign, the amount of data can be easily known with restoration equipment. What is necessary is just to determine the progressive restoration image which should notify this amount of data to the display hierarchy decision means 9 from a central processing unit 10, and should display it based on the notified amount of data.

[0067] Furthermore, the rate (for example, transmission speed of a transmission line) which inputs hierarchy code data is measured, when a rate is quick, a small number of progressive restoration image is displayed, and when a rate is slow, you may determine to display many progressive restoration images.

[0068]

[Effect of the Invention] When many progressive restoration images are generated for a short time according to this invention so that clearly from the above explanation, by displaying a progressive restoration image alternatively, a flicker of a screen can be prevented and the image of high image quality can be displayed for a long time.

[Translation done.]

* NOTICES *

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- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the principle explanatory view of this invention.

[Drawing 2] It is drawing showing the 1st example of the hierarchy code data restoration equipment of this invention.

[Drawing 3] It is the timing diagram which shows actuation of the 1st example of the hierarchy code data restoration equipment of this invention.

[Drawing 4] It is drawing showing the 2nd example of the hierarchy code data restoration equipment of this invention.

[Drawing 5] It is the timing diagram which shows actuation of the 2nd example of the hierarchy code data restoration equipment of this invention.

[Drawing 6] It is drawing showing the 3rd example of the hierarchy code data restoration equipment of this invention.

[Drawing 7] It is the timing diagram which shows actuation of the 3rd example of the hierarchy code data restoration equipment of this invention.

[Drawing 8] It is drawing showing conventional hierarchy code data restoration equipment.

[Drawing 9] It is drawing showing the example of the structure of a system which used image restoration LSI.

[Drawing 10] It is drawing showing actuation of the conventional example.

[Description of Notations]

1 Image Restoration Integrated Circuit

2 + Circuit

3 -128 Circuit

4 Frame Memory

4' Image buffer memory

5 -128 Circuit

6 Value Limiting Circuit

7 Write-in Control Means

8 Timer

9 Display Hierarchy Decision Means

[Translation done.]

* NOTICES *

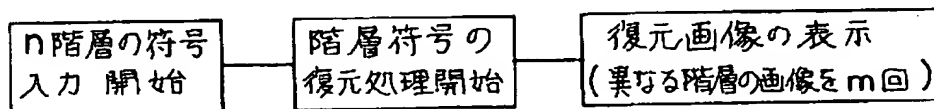
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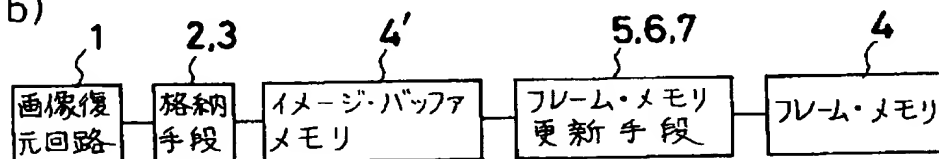
DRAWINGS

[Drawing 1]

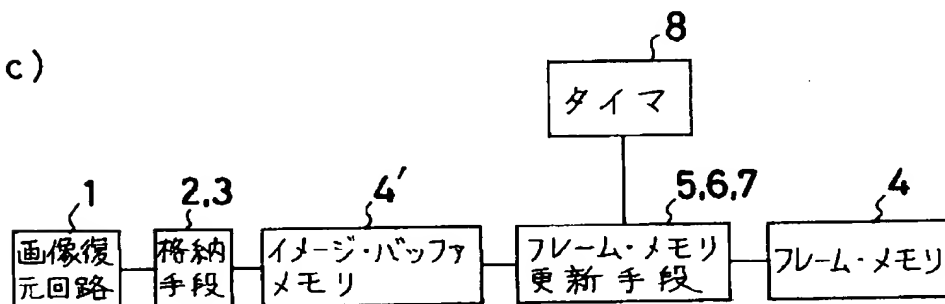
(a) 本発明の原理説明図



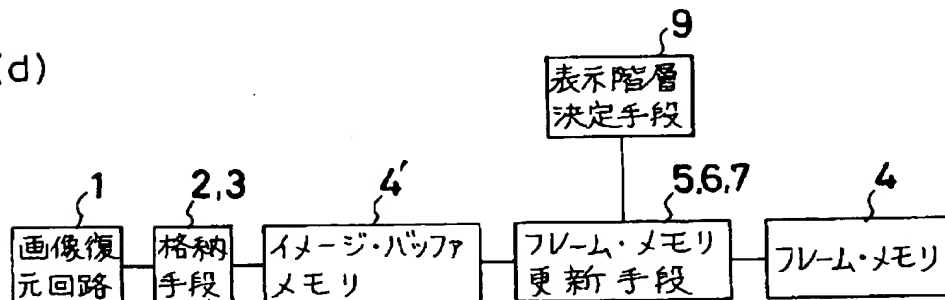
(b)



(c)

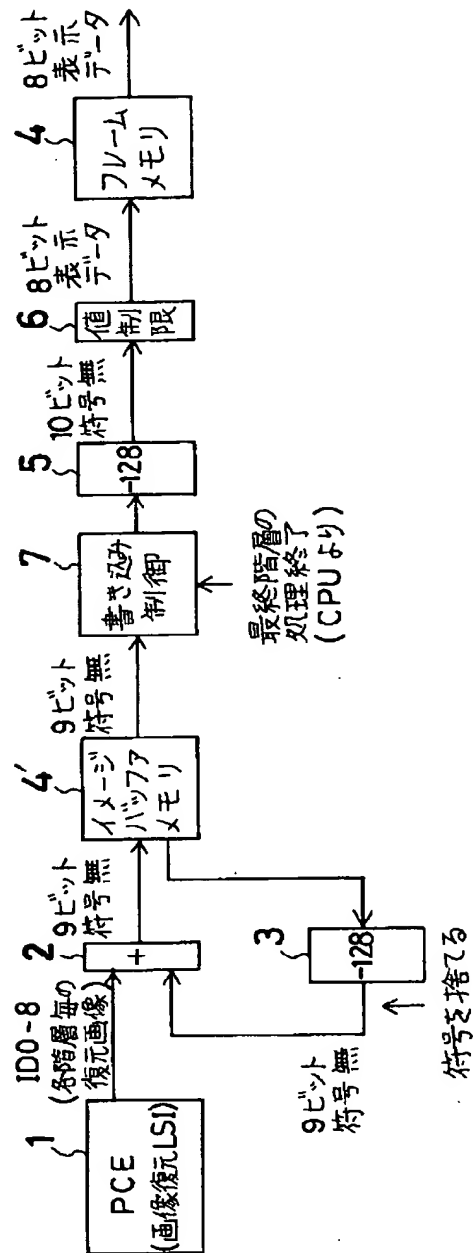


(d)



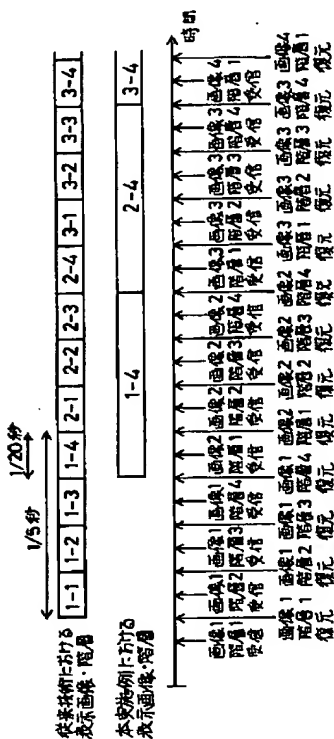
[Drawing 2]

本発明の階層符号データ復元装置の第1実施例



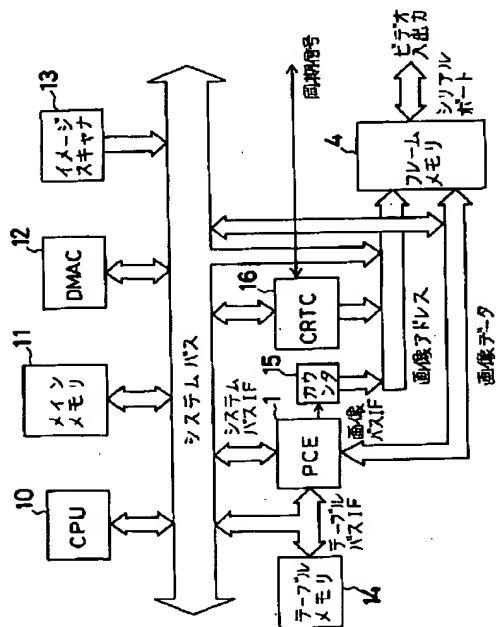
[Drawing 3]

第1実施例の動作を示すタイムチャート



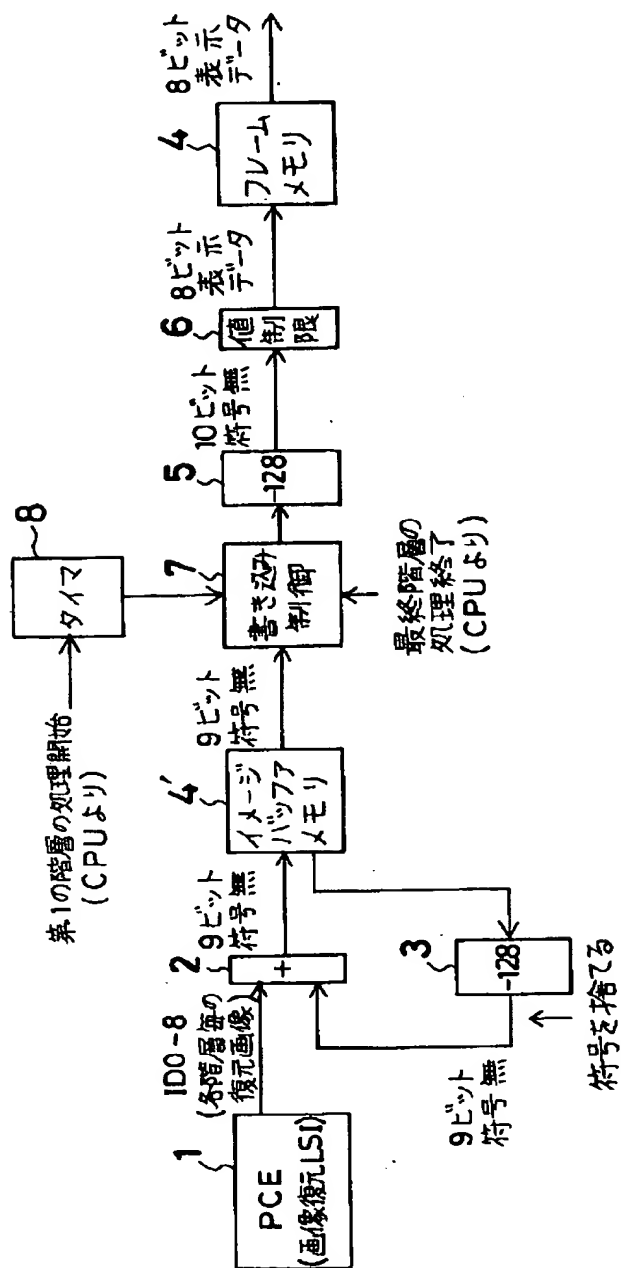
[Drawing 9]

画像復元LSIを使用したシステムの構成例



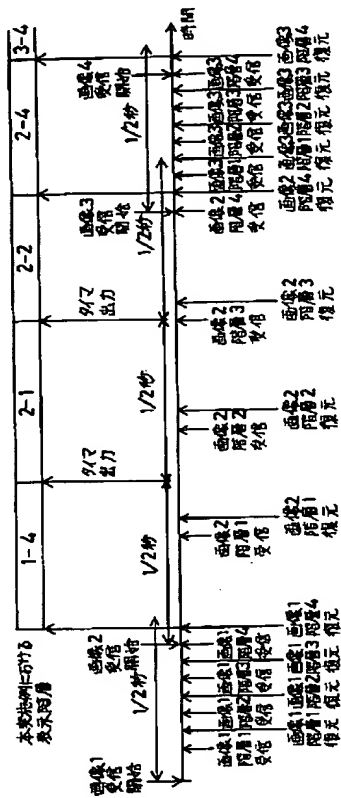
[Drawing 4]

本発明の階層符号データ復元装置の第2実施例



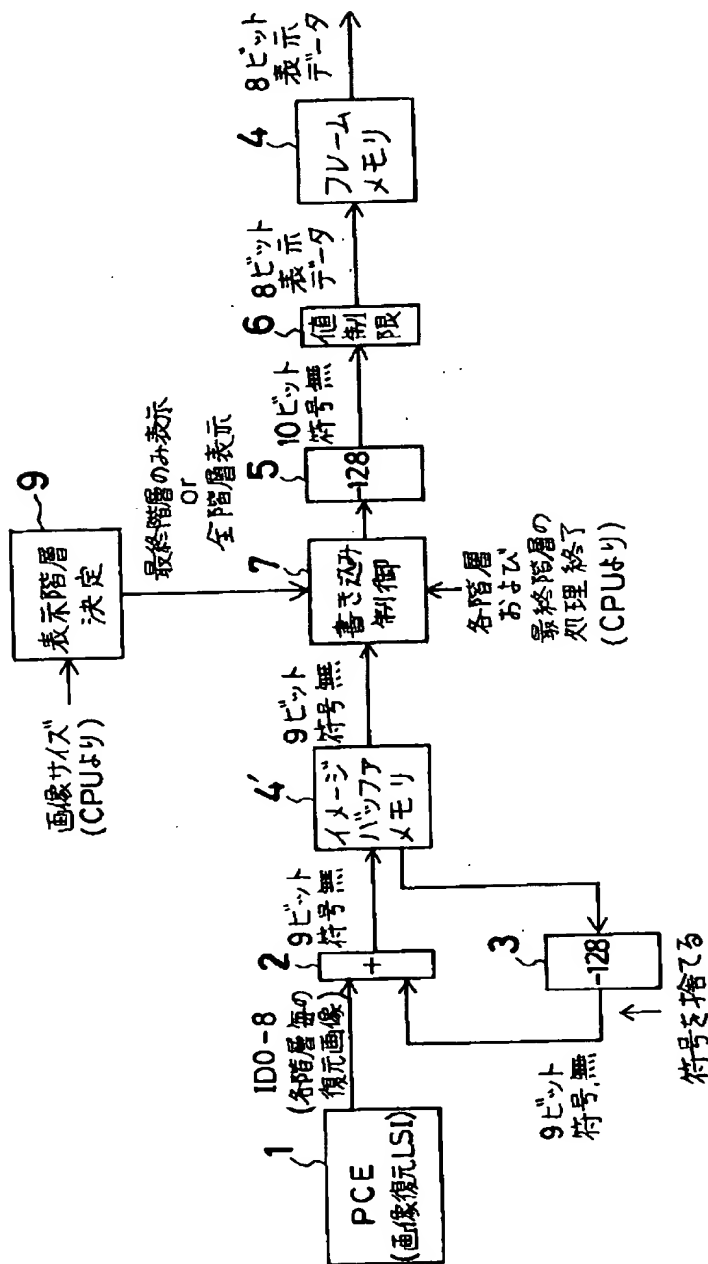
[Drawing 5]

第2実施例の動作を示すタイムチャート



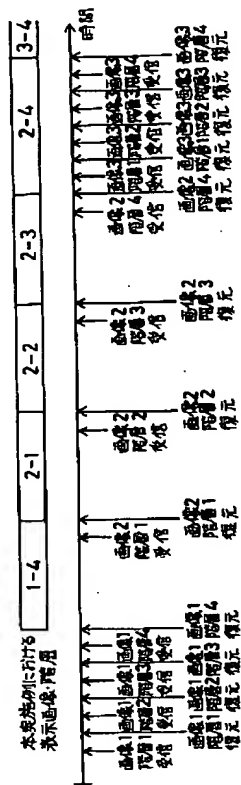
[Drawing 6]

本発明の階層符号データ復元装置の第3実施例



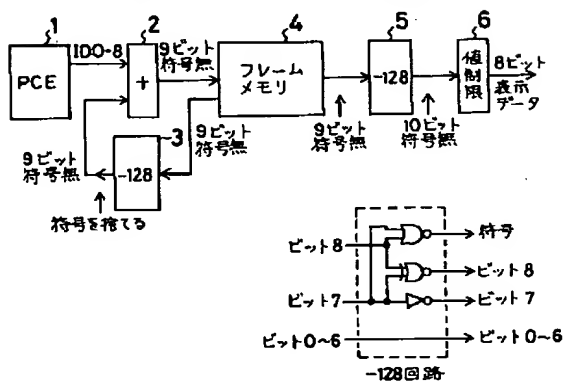
[Drawing 7]

第3実施例の動作を示すタイムチャート



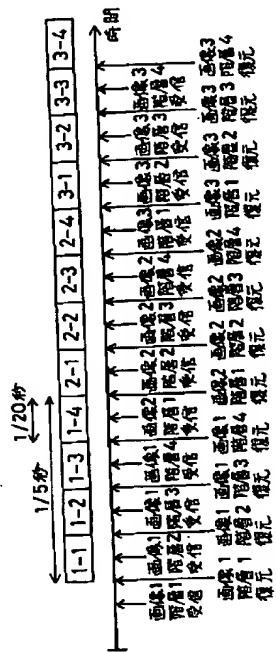
[Drawing 8]

従来の階層符号データ復元装置



[Drawing 10]

従来例の動作を示すタイムチャート



[Translation done.]

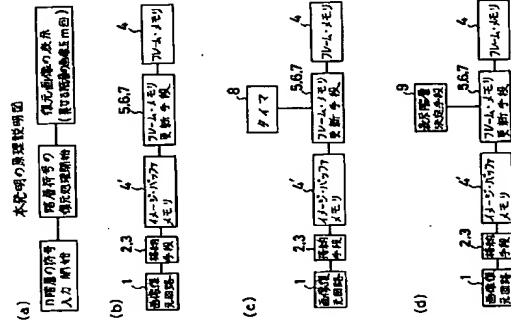
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G06T 9/00					
H04N 1/41					
			B		
				H04N 7/13	Z
				G06F 15/06	330 H
				審査請求 未請求	請求項の数12 O L (全 15 頁)
					8420-5L
(21)出願番号	特願平5-274316			(71)出願人	00005223 富士通株式会社
(22)出願日	平成5年(1993)11月2日			(72)発明者	神奈川県川崎市中原区上小田中1015番地 清水 裕芳
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(54)【発明の名称】 画像データの復元表示方法および装置

(57)【要約】

【目的】 プログレッシブ復元時に高品位な画像の表示時間を確保すること。

【構成】 図1(a)に示すように、第1階層の符号データ、第2階層の符号データ、…、第n階層の符号データが入力され、第1階層～第n階層の符号データによって第1番目の復元画像が生成される。本発明によれば、最後の復元画像のみが表示される。図1(b)のフレーム・メモリ更新手段は、第n階層の符号データの処理が終了した時に、メモリ4の復元画像をメモリ4に移す。図1(c)のフレーム・メモリ更新手段はタイマが一定時間を経過する毎に又は第n階層の符号データの処理が終了した時に、メモリ4の内容をメモリ4に移す。図1(d)の表示制御決定手段は、画像サイズなどを参照して表示すべき復元画像を決定する。図1(d)のフレーム・メモリ更新手段は、決定された復元画像が生成された時に、メモリ4の内容をメモリ4に移す。



画像の第1階層 (iは1, 2, …, n) の符号データを復元して得られる復元画像と、第1階層ないし第(i-1)階層の符号データを復元して得られた第(i-1)番目のプログレッシブ復元画像とに基づいて第i番目のプログレッシブ復元画像を生成し、プログレッシブ復元画像を表示する画像データの復元表示方法であつて、

画像の表示所要時間を算出し、算出結果に基づいてディスプレイに表示するプログレッシブ復元画像を決定することを特徴とする画像データの復元表示方法。

【請求項6】 画像についての第1階層の符号データ、第2階層の符号データ、…、第n階層の符号データを送られてくる順序に従って復号化し、

画像の第1階層 (iは1, 2, …, n) の符号データを復元して得られる復元画像と、第1階層ないし第(i-1)階層の符号データを復元して得られた第(i-1)番目のプログレッシブ復元画像とに基づいて第i番目のプログレッシブ復元画像を生成し、プログレッシブ復元画像を表示する画像データの復元表示方法であつて、

画像の表示所要時間に基づいて、全てのプログレッシブ復元画像を表示するか、限定された数のプログレッシブ復元画像を表示するかを判断し、判断結果に基づいてプログレッシブ復元画像をディスプレイに表示することを特徴とする画像データの復元表示方法。

【請求項7】 画像についての第1階層の符号データ、第2階層の符号データ、…、第n階層の符号データを送られてくる順序に従って復号化し、

画像の第1階層 (iは1, 2, …, n) の符号データを復元して得られる復元画像と、第1階層ないし第(i-1)階層の符号データを復元して得られた第(i-1)番目のプログレッシブ復元画像とに基づいて第i番目のプログレッシブ復元画像を生成し、プログレッシブ復元画像を表示する画像データの復元表示方法であつて、

画像サイズが大きい場合には多数のプログレッシブ復元画像をディスプレイに表示し、画像サイズが小さい場合には少数のプログレッシブ復元画像をディスプレイに表示することを特徴とする画像データの復元表示方法。

【請求項8】 画像についての第1階層の符号データ、第2階層の符号データ、…、第n階層の符号データを送られてくる順序に従って復号化し、

画像の第1階層 (iは1, 2, …, n) の符号データを復元して得られる復元画像と、第1階層ないし第(i-1)階層の符号データを復元して得られた第(i-1)番目のプログレッシブ復元画像とに基づいて第i番目のプログレッシブ復元画像を生成し、プログレッシブ復元画像を表示する画像データの復元表示方法であつて、

画像のデータ量が大きい場合には多数のプログレッシブ

復元画像をディスプレイに表示し、画像のデータ量が小さい場合には少数のプログレッシブ復元画像をディスプレイに表示することを特徴とする画像データの復元表示方法。

【請求項 9】 画像についての第 1 階層の符号データを第 2 階層の符号データ、…、第 n 階層の符号データを送られてくる順に従って復号化し、

画像の第 1 階層 (i=1, 2, …, n) の符号データを復号化して得られる復元画像と、第 1 階層以外の第 (i-1) 階層の符号データを復号化して得られた第 (i-1) 番目のプログレッシブ復元画像とに基づいて第 i 番目のプログレッシブ復元画像を生成し、プログレッシブ復元画像を表示する画像データの復元表示方法であって、

画像の符号化条件に基づいて、ディスプレイに表示すべきプログレッシブ復元画像を決定することを特徴とする画像データの復元表示方法。

【請求項 10】 入力された第 1 階層 (i=1, 2, …, n) の符号データに基づいて復元画像を生成する画像復元回路 (1) と、

イメージ・バッファ・メモリ (4') と、画像復元回路 (1) から出力される第 1 階層 (i=1, 2, …, n) の符号データによる復元画像とイメージ・バッファ・メモリ (4') に格納されている第 (i-1) 番目のプログレッシブ復元画像とに基づいて第 1 番目のプログレッシブ復元画像を生成し、第 1 番目のプログレッシブ復元画像をイメージ・バッファ・メモリ (4') に格納する格納手段 (2, 3) と、

表示データを格納するフレーム・メモリ (4) と、イメージ・バッファ・メモリ (4') とフレーム・メモリ (4) との間に設置されたフレーム・メモリ更新手段 (5, 6, 7) とを具備し、

フレーム・メモリ更新手段 (5, 6, 7) は、予め定められた階層の符号データの処理が終了した時に、イメージ・バッファ・メモリ (4') の内容に上からフレーム・メモリ (4) の内容を更新することを特徴とする画像復元装置。

【請求項 11】 入力された第 1 階層 (i=1, 2, …, n) の符号データに基づいて復元画像を生成する画像復元回路 (1) と、

イメージ・バッファ・メモリ (4') と、画像復元回路 (1) から出力される第 1 階層 (i=1, 2, …, n) の符号データによる復元画像とイメージ・バッファ・メモリ (4') に格納されている第 (i-1) 番目のプログレッシブ復元画像とに基づいて第 1 番目のプログレッシブ復元画像を生成し、第 1 番目のプログレッシブ復元画像をイメージ・バッファ・メモリ (4') に格納する格納手段 (2, 3) と、

表示データを格納するフレーム・メモリ (4) と、イメージ・バッファ・メモリ (4') とフレーム・メモリ

(4) との間に設置されたフレーム・メモリ更新手段 (5, 6, 7) と、

タイマ (8) とを具備し、タイマ (8) は、画像の受信時に初期化され、それ以降は一定時間を計測する毎に表示指令を発生し、

フレーム・メモリ更新手段 (5, 6, 7) は、最終階層の処理が終了した時にイメージ・バッファ・メモリ (4') の内容にしたがってフレーム・メモリ (4) の内容を更新すると共に、タイマ (8) が表示指令を発生した時にイメージ・バッファ・メモリ (4') の内容にしたがってフレーム・メモリ (4) の内容を更新することを特徴とする階層符号データ復元装置。

【請求項 12】 入力された第 1 階層 (i=1, 2, …, n) の符号データに基づいて復元画像を生成する画像復元回路 (1) と、

イメージ・バッファ・メモリ (4') と、画像復元回路 (1) から出力される第 1 階層 (i=1, 2, …, n) の符号データによる復元画像とイメージ・バッファ・メモリ (4') に格納されている第 (i-1) 番目のプログレッシブ復元画像とに基づいて第 1 番目のプログレッシブ復元画像を生成し、第 1 番目のプログレッシブ復元画像をイメージ・バッファ・メモリ (4') に格納する格納手段 (2, 3) と、

表示データを格納するフレーム・メモリ (4) と、イメージ・バッファ・メモリ (4') とフレーム・メモリ (4) との間に設置されたフレーム・メモリ更新手段 (5, 6, 7) と、

表示階層決定手段 (9) とを具備し、表示階層決定手段 (9) は、表示すべきプログレッシブ復元画像を決定し、

フレーム・メモリ更新手段 (5, 6, 7) は、表示階層決定手段 (9) で決定されたプログレッシブ復元画像が生成された時に、イメージ・バッファ・メモリ (4') の内容にしたがってフレーム・メモリ (4) の内容を更新することを特徴とする階層符号データ復元装置。

【発明の詳細な説明】
【0001】

【産業上の利用分野】 本発明は、階層的に符号化した画像データの復元表示方法および装置に関するものである。画像データのデータ量は文字等に比べて非常に大きいため、格納したり、伝送したりするときに、データ量を圧縮する符号化技術が広く利用され始めた。種々の符号化方法の中でも、階層的な符号化方法は、遅い伝送回線を用いて伝送する場合に有利な方法として注目されている。

【0002】 階層的な符号化方法とは、画像を複数の階層にわけて符号化する方法である。例えば、5 つの階層に符号化したデータであれば、第 1 の階層のデータを復元すると粗い大まかな画像を得ることができ、第 1 ～ 2, 第 1 ～ 3, …, 第 1 ～ 5 と言うように、復元する階

層を増やすと、より鮮明な画像を復元することが出来る。本発明は、階層的な符号化方法によって符号化された画像データの復元表示方法および装置において、短時間にも多数の画像を表示する場合に於けるらつきを防止し、表示画像の品質を高めるものである。

【0003】

【従来の技術】 階層的に符号化された画像データの復元表示にかかわる装置は、特許「電子技術」1991 年 6 月号の第 20 頁～第 25 頁の「カラー静止画符号化システム」の特許と応用」に報告されている。以下、この文献を文献 1 とする。図 8 は文献 1 の図 1 と同じものである。図 8 において、1 は画像復元回路、2 は回路、3 は 128 回路、4 はフレーム・メモリ、5 も 128 回路、6 は値制限回路を示している。

【0004】 画像復元回路 1 は、ADCT (Adaptive Discrete Cosine Transform) 方式で符号化された符号データを復元するものであり、+128 のオフセットを加えた復元画像を出力する。+回路 2 は、画像復元回路 1 から出力される画像値と、フレーム・メモリ 4 に格納されている同一画像値から 128 を計算したものと加算する。+回路 2 の出力は、フレーム・メモリ 4 に格納される。フレーム・メモリ 4 は、128 のオフセットを持つプログレッシブ復元画像を格納する。フレーム・メモリ 4 から読み出されたデータは、-128 回路 5 および値制限回路 6 を経由し、8 ビットの表示データとして出力される。

【0005】 画像は例えば 8×8 画素のブロックに分割される。各ブロックの部分画素は、64 個の DCT 係数で表現される。64 個の DCT 係数は、例えば 4 つのグループに分割される。送信側は、最初に各グループの第 1 グループの並び (ブロック毎の画素値の平均値を含む) を表す第 1 階層の符号データを送信し、次に各ブロックの第 2 グループの並びを表す第 2 階層の符号データを送信し、次に各ブロックの第 3 グループの第 3 グループの並びを表す第 3 階層の符号データを送信し、最後に各ブロックの第 4 グループの並びを表す第 4 階層の符号データを送信する。

【0006】 画像の第 1 階層の符号データが入力されると、画像復元回路 1 は第 1 階層の符号データを復号化して得られる復元画像を出力する。第 1 階層の符号データに基づく復元画像は、そのままフレーム・メモリ 4 に格納される。

【0007】 画像の第 2 階層の符号データが入力されると、画像復元回路 1 は第 2 階層の符号データを復号化して得られる復元画像を出力する。第 2 階層の符号データに基づく復元画像と、フレーム・メモリ 4 に格納されている第 1 番目のプログレッシブ復元画像 (図 8 に -128 されたもの) とを加算され、第 2 番目のプログレッシブ復元画像が生成され、第 2 階層の符号データに基づく復元画像がフレーム・メモリ 4 に格納される。

【0008】 画像の第 3 階層の符号データが入力されると、画像復元回路 1 は第 3 階層の符号データを復号化して得られる復元画像を出力する。第 3 階層の符号データに基づく復元画像と、フレーム・メモリ 4 に格納されている第 2 番目のプログレッシブ復元画像とを加算され、第 3 番目のプログレッシブ復元画像が生成され、第 3 階層の符号データがフレーム・メモリ 4 に格納される。

【0009】 画像の第 4 階層の符号データが入力されると、画像復元回路 1 は第 4 階層の符号データを復号化して得られる復元画像を出力する。第 4 階層の符号データに基づく復元画像と、フレーム・メモリ 4 に格納されている第 3 番目のプログレッシブ復元画像とを加算され、第 4 階層の符号データがフレーム・メモリ 4 に格納される。

【0010】 図 3 の階層符号データ復元装置によれば、1 階層のデータが復元される度に表示データが変更される。つまり、階層的に符号化された符号データを受信し、復元表示する場合とすれば、1 階層の符号データが復元され、そのデータが復元される毎に復元画像が高品位なものに切り替わることになる。伝送回路が低速で、1 画像の伝送が終了するまでに長い時間がかかる場合には、受信側では、1 画像の全てのデータの伝送が終了するのを待たずに、受信開始して直ちに大まかな画像の全容を見ることができ、次第に高品位な画像を見ること出来る。この方法によれば、受信画像を見ていない人にとって心理的負担が軽減などの効果があり、有効な表示方法と看做される。

【0011】 図 4 は画像復元システムを使用したシステムの構成例を示す図である。図 4 において、1 は画像復元回路、4 はフレーム・メモリ、10 は中央処理装置、11 はメイン・メモリ、12 は DMA コントローラ、13 はイメージ・スキャナ、14 はデコーダ・メモリ、15 はカウンタ、16 は CRT コントローラをそれぞれ示している。図 4 は文献 1 の図 2 と同じものである。画像復元回路 1 は、画像データを ADCT 方式で符号化する機能をも有している。図示しないが、LAN を制御する LAN プロセッサがシステム・バスに接続されている。

【0012】

【発明が解決しようとする課題】 このように従来の技術は、伝送回路が低速の場合には非常に有効なものである。しかし、LAN などの高速な伝送回路を用い、短時間にも多数の画像を復元表示する場合を想定したものである。そのため、高速な伝送回路を用いて短時間にも多数の画像を復元表示する場合に従来の装置を用いると、以下のような問題が生じる。

【0013】 図 10 は図 8 に示した従来の動作を示すタイムチャートである。例えば、4 階層に符号化した多

数の画像データを5画像/秒で伝送し、これを同じく5画像/秒で復元・表示する場合を想定する。「受信」という用語は復元が終了した時刻を示し、従来の装置で用いるのは復元が終了した時刻を示している。従来の装置が1/5秒間隔で復元される、この1/5秒間隔に大まかな画像から高品位な画像へと次第に切り替わることになる。

【0014】これでは、1/20秒毎に画像がかわり、各画像が1/5秒間の表示時間であり、また、各画像の1/5秒間の表示時間のうち、高品位な画像の表示時間は僅かに1/20秒であり、画像を見ている人にとって低品位な画像の視聴時間が多いこととなる。

【0015】図1のAはあくが、検査装置において表示装置の要請が1/20秒を越えるとき、若干の「待機」を要し、不快なものと考へられる。したがって、大體に思ひやうなならば、1/20秒より短い期間で画像の品位を向上させたためのプログラムで表示画像の変更を行って、「待ち」を減らす意味は無く単に画像がちらつきを増えさせ、見にいいだけである。本発明は、短時間で高品位な画像化された画像データを変元表示する場面に、高品位な画像の表示時間を確保し、画像のちらつきを抑えることを目的としている。

[0016]

【問題】を解決するための手段、請求項１の画像データへの復元表示方法は、前記第１階層の符号データの復元処理において、第１階層の符号データを第２階層の符号データ、…、第 n 階層の符号データ（ $i=1, 2, \dots, n$ ）の符号データを復号化して得られる第 i 階層と、第１階層以下に第（ $i-1$ ）階層の符号データを復号化した上で、第１目的のプロログレッシング復元画像とに基づいて、第１目的のプロログレッシング復元画像と生成し、プロッグレッシング復元画像を表示する画像データの前記表示方法であって、 n 個のプロログレッシング復元データのうちの m 個（ m はより小）のプロッグレッシング復元画像をディスプレイに表示することを特徴とするものである。

【0017】請求項2の画像データの復元表示方法は、請求項1の画像データの復元表示方法において、ディスプレイに表示するブログレッシング復元画像が第n番目のブログレッシング復元画像であることを特徴とするものである。

【0018】情報塊3の画像データ領域の記憶方式は、画像データについての第1段階の符号データを第2段階の符号データとして、第1段階の符号データを第2段階の符号データに逐次復号化し、画像の第1階段（ $i=1, 2, \dots, n$ ）の符号データを復号化して得られる元の画像と、第1段階ないし第（ $i-1$ ）段階の符号データを復号化した後に得られた第（ $i-1$ ）番目のプログラミング演算処理生成物に基づいて第1番目のプログラミング演算処理生成物を、プログラミング演算処理を指示する画像データの復号し、およびプログラミング演算処理生成物の再合成を行う。

元表示方法であって、画像の第1暗画の符号データの受信開始時にタイムを初期化し、タイムが一定時間を計時する度に、その時点で生成されているプログレッシブ復元画像をディスプレイに表示すると共に、最後のプログレッシブ復元画像を表示することを特徴とするものである。

[illegible]

【0020】図6は第5の画像データの符号化表示方法に於いて、第1階層の符号データ、第2階層の符号データ、…、第*n*階層の符号データを逐次得られる順で階層データとして並び替えて、画像の第1階層（*i*=1、2、…、*n*）の符号データを符号化して得られる元画像と、第1階層ないし第（*i*-1）階層の符号データを符号化して得られた第（*i*-1）番目のプログレッシブ元画像を逐次生成することに基づいて、第1番目のプログレッシブ元画像を生成するまでの間に、プログレッシブ元画像の表示所需時間を経由し、階層に基いてディスプレイに表示するプログレッシブ元画像を決定づけることを特徴とするものである。

[illegible]

【0022】請求項7の画像データの復元表示方法は、画像についての第1階層の符号データ、第2階層の符号データ、…、第n階層の符号データを送られてくる順序に従って復号化し、画像の第i階層(iは1, 2, …,

第 1 項の符号データを復号して得らるる復元データと、第 2 項の符号データを復号して得らるる復元データとを比較し、両者が一致しない第 1 (ー 1) 番目のプログラムブロックが復元画像化された第 1 のプログラムブロックで復元画像生成を生成する。

次に、プログラッング復元値を表示する画像データの復元元データ方法であって、画像サイズが大い場合には多数のプログラッング復元値をディスプレイに表示し、画像サイズが小さい場合には少数のプログラッング復元値をディスプレイに表示することを特徴とするものである。

【0023】本発明の第8の段階データの復元表示方法は、
画面上に、第1段階の符号データ、第2段階の符号データ、…、第n段階の符号データと並べられて、順序データに依って復号化し、画像の第1段階（1は1、2、…、n）の符号データを復号化して得られる復元画像と、第1段階でない第（i-1）段階の符号データを復号化して得られる第i第（i-1）番目のプログレンジング復元画像とに基づいて第1番目のプログレンジング復元画像と生成し、プログレンジング復元画像を表示する画像データの復元表示方法であって、画像のデータ量が大きい場合には、多数のプログレンジング復元画像をディスプレイに提示し、画像のデータ量が小さい場合には複数のプログレンジング復元画像をディスプレイに表示することを特徴とするものである。

【0024】例えば第9の画像データの符号表示方法は、前記第9の画像データ、第2階層の符号データ、…、第*i*-1階層の符号データを送られてくる順序に従って、符号化し、階層 (*i*) は1, 2, …, *n*) の符号データを符号化して得られる復元画像と、第1階層ないし第 (*i*-1) 階層の符号データを復元化した1階層ないし第 (*i*-1) 番目のプログレッシブ復元画像とで得られた第 (*i*-1) 番目のプログレッシブ復元画像を生成したことに基づいて第1番目のプログレッシブ復元画像を決定し、プログレッシブ復元画像と表示する画像データをデコードする方法であって、画像の符号化条件に基づいて、要素ストリームに格納すべきプログレッシブ復元画像を決定することを特徴とするものである。

[illegible]

7) は、予め定められた附随の符号データの処理を終了した時に、イメージ・パツファ・メモリ(4')の内容に上たがってフレーム・メモリ(4)の内容を更新することを特徴とするものである。

【0026】第1項1-1)の顔面符号データ復元処理は、

と、イメージ・バックアップ・メモリ(4)とフレーム・メモリ(4)との間に設置されたタイマー・メモリ更新手段(6)は、タイマー・メモリ(8)と見出し、タイマー(8)は、画像の受信時に加減され、それ以降は一定時間を計測する毎に表示指令を発生し、フレーム・メモリ更新手段(5, 6, 7)は、最短期間の処理を終了した際にイメージ・バックアップ・メモリ(4)の内容にしたがってフレーム・メモリ(4)の内容を更新する。タイマー(8)が表示指示命令を発生した時にイメージ・バックアップ・メモリ(4)の内容を更新することとなるのである。

[illegible]

と、イメージ・マップ・メモリ(4')とフレーム・メモリ(5,6)との間に設置されたフレーム・メモリ更新手段(9)と、我知能決定手段(9)とも備し、表示制御回路決定手段(9)は、表示手段としてプログラム処理画面画像生成手段(9)は、表示手段としてプログラム処理画面画像生成手段(9)を決定し、フレーム・メモリ更新手段(6,6')は、表示手段としてプログラム処理画面画像生成手段(9)で決定されたプログラム処理画面画像生成手段(9)が生成された際に、イメージ・マップ・メモリ(4')の内容を更新する内容によったことによってフレーム・メモリ(4)の内容を更新するのである。

【0028】
【作用】図1(a)は請求項1の発明の原理説明図であ
る。上述したように、従来の技術では n ($n > 1$) 階層
に階層的に符号化した画像データ（以下、階層的に符号

化する場合がある。また、様々な大きさの画像（データ量も様々な）を送信回路を通して受信し、これを復元する場合もある。

【0050】このように、伝送所要時間が異なるときは、伝送所要時間の低い画像については、送信のプログラミング復元画像も表示したがが画像を見ている人に待たせたくないため、快速に運用できる。第2実施例においては、伝送所要時間に応じて自動回数数を自動的に決定する構成とした。また、この実施例では、データは様々な方法で送られるが、第2実施例では、データの受信や復元に要する時間（送信所要時間）を評価し、それをもとに決定するようにした。

【0051】第2実施例の構成は、従来のフレーム・メモリ4がイメージ・バッファ・メモリ4'に置き換えられ、新たにフレーム・メモリ4、書き込み制御手段7およびタイマ8が追加されている。また、システム全体の構成に含まれる中央処理装置10には、最終階層の処理終了を検出し、出力する機能が必要となる。さらに、中央処理装置10には、各階層の受信開始を出力する機能が必要である。

【0052】第2実施例の各部の機能について説明する。イメージ・バッファ・メモリ4'、フレーム・メモリ4、各階層の受信開始信号によって初期化され、それ以降は一定時間毎に受信開始を発生する。この信号発生間隔は、画像を見ている人に対して画像表示の待ちを感じさせない程度であれば良く、例えば1/2秒程度に設定すれば良い。以下、1/2秒と設定した場合について説明する。

【0053】書き込み制御手段7は、最終階層の処理終了が検出されるか又はタイマ8から表示指令が発生されるまで待っている。最終階層の処理終了が検出される場合はタイマ8から表示指令が発生されると、イメージ・バッファ・メモリ4'の内容（実際には8ビットに交換されたもの）をフレーム・メモリ4に転送し、フレーム・メモリ4の内容を書き換える。

【0054】図5は第2実施例の動作を示すタイムチャートである。図5は、4階層に符号化したデータを復元する場合を示している。画像1の受信開始より1/12秒経過しないから、画像2の受信が始まり、タイマ8がリセットされるから、画像1については最後のプログラミング復元画像だけが表示される。画像1は短期間で表示できるのだから、最後のプログラミング復元画像以外は表示しない方がちがらつきが無く非常に鮮明で見やすくなる。

【0055】画像2の受信開始から1/2秒が経過してもまだ画像3の受信が始まらなから、画像2については、タイマ8から出力される表示指令（1/2秒ごと）に応じて途中のプログラミング復元画像も表示される。全ての階層を受信し終わるより大幅に早く画像が表示さ

れるので、画像を見ている人に対して待ちを感ぜさせない。画像3は、画像1と同様に、最後のプログラミング復元画像以外は表示されない。

【0056】このように本発明の第2実施例においては、1画像についての最後のプログラミング復元画像表示までの所要時間が短い場合は、第1実施例と同様に無用の画像の書き換えがたいめ、各表示画像にちがつきが無く非常に見やすくなる。また、1画像表示までの所要時間が短い場合、第1実施例と同様に各画像に割り当てられた表示時間の全てが品質の画像（最後のプログラミング復元画像）の表示に使われており、表示画像が常に高画質であることが判る。さらに、第2実施例においては、1画像の最後のプログラミング復元画像の表示までの所要時間が長い場合は、次第に画質が向上するように表示され、画像を見ている人に対して待ちを感ぜさせない。

【0057】図6は本発明の階層符号データ復元装置の第3実施例の構成を示す図である。図6において、9は表示階層決定手段を示す。なお、図2と同一符号は同一物を示す。第3実施例は、第2実施例と同様に、1枚の画像を復元するのに要する時間が短時間で済む場合と、長時間かかる場合が存在することを想定している。第3実施例では、画像の大きさに依存して階層符号を送送する時間が決まり、この伝送時間が画像の復元までの時間を左右しているものとする。

【0058】第3実施例の構成は、従来のフレーム・メモリ4がイメージ・バッファ・メモリ4'に置き換えられ、新たにフレーム・メモリ4、書き込み制御手段7および表示階層決定手段9が追加された構成となっている。また、システム全体の構成の中の中央処理装置10は、JPEG方式のヘッダを解析して画像の大きさを判定する機能を有すると共に、各階層および最終階層の処理終了を検出し出力する機能を持つことが必要となる。

【0059】JPEG方式のヘッダの構成については、雑誌「インターフェース'91年12月号の特集記事「画像データ圧縮の理解と応用（160頁〜203頁）」（以下、参考文献2）において、詳しく説明されている。この参考文献2の175頁の図25に記載されているマーカ・セグメントの構成を解析し、このフレーム・ヘッダのYとXの値を取れば、画素数つまり画像サイズを得ることが出来る。

【0060】第3実施例の各部の機能を説明する。イメージ・バッファ・メモリ4'、フレーム・メモリ4の機能は、第1実施例と同様である。表示階層決定手段9は、画像サイズが図6に示すように、以下、1/2秒と設定した場合について説明する。

【0061】第3実施例では、全てのプログラミング復元画像を表示する場合は、各階層の処理終了が検出される度にイメージ・バッファ・メモリ4'の内容（実際には8ビットに交換されたもの）をフレーム・メモリ4に転送し、フレーム・メモリ4の内容を書き換える。最後のプログラミング復元画像のみの表示の場合は、最終処理終了が検出されたならばイメージ・バッファ・メモリ4'の内容（実際には8ビットに交換されたもの）をフレーム・メモリ4に転送し、フレーム・メモリ4の内容を書き換える。

【0063】図7は第3実施例の動作を示すタイムチャートである。図7は4階層に符号化した階層符号を復元する場合を示している。このタイムチャートでは、画像1、画像3は画像サイズが小さいので、最後のプログラミング復元画像のみの表示とし、画像2は画像サイズが大きいため、全てのプログラミング復元画像の表示として大場合を示している。図7から明らかなように、短時間で表示できる場合は最後のプログラミング復元画像のみが表示され、表示に長い時間を要する場合は徐々に画質が向上するように表示される。したがって、画像を見ている人にちがつきによる不快感を感じさせることも、表示時間が長くなることによる音立ちを感じさせることもない。

【0064】第3実施例では画像サイズを基準に表示するプログラミング復元画像を決定しているが、表示すべきプログラミング復元画像の決定の方法はこれに限られるものではない。例えば、階層符号のデータ量は、符号化条件にも大きく左右される。高圧縮になる符号化条件で符号化された階層符号のデータ量は少なく、低圧縮になる符号化条件で符号化された階層符号のデータ量は多い。従って、符号化条件を基準に表示すべきプログラミング復元画像を決定する方法は有効である。

【0065】具体的に言えば、JPEG方式で、参考文献2の第165頁〜第167頁に記載されているように、量子化関値によって符号化条件を制御する。参考文献2の178頁の図25に記載されているマーカ・セグメントの構成にあるように、この量子化関値の値は、マーカ・セグメントを解析することによって容易に得られる。したがって、この量子化関値を、中央処理装置10から表示階層決定手段9に通知し、この値をもとに決定すれば良い。

【0066】また、1画像の階層符号のデータ量が符号受信開始時に判るのであれば、このデータ量をもとにし

て、データ量が多いとき多数のプログラミング復元画像を表示し、データ量が少いとき少数のプログラミング復元画像を表示するように決定しても良い。例えば、階層符号を送信する側で、階層符号を送送する前にデータ量を受信側（復元装置）に通知するようにすれば、復元装置でデータ量を知ることが出来る。このデータ量を中央処理装置10から表示階層決定手段9に通知し、通知されたデータ量をもとに表示すべきプログラミング復元画像を決定すれば良い。

【0067】さらに、階層符号データを入力する速度（例えば、伝送路の伝送速度）を制御し、速度が遅いときは少数のプログラミング復元画像を表示し、速度が遅いときは多数のプログラミング復元画像を表示するように決定しても良い。

【0068】

【発明の効果】以上の説明から明らかなように、本発明によれば、短時間に多数のプログラミング復元画像が生成される場合に、プログラミング復元画像を選択的に表示することによって、画面のちがつきを防止し、高い画質の画像を長時間表示することが出来る。

【図面の簡単な説明】

【図1】本発明の原理説明図である。

【図2】本発明の階層符号データ復元装置の第1実施例を示す図である。

【図3】本発明の階層符号データ復元装置の第1実施例の動作を示すタイムチャートである。

【図4】本発明の階層符号データ復元装置の第2実施例を示す図である。

【図5】本発明の階層符号データ復元装置の第2実施例の動作を示すタイムチャートである。

【図6】本発明の階層符号データ復元装置の第3実施例を示す図である。

【図7】本発明の階層符号データ復元装置の第3実施例の動作を示すタイムチャートである。

【符号の説明】

1	画像復元装置
2	+
3	-128回路
4	フレーム・メモリ
4'	イメージ・バッファ・メモリ
5	-128回路
6	値制限回路
7	書き込み制御手段
8	タイマ
9	表示階層決定手段

